

REMARKS

Claims 1-4 are pending in this application and stand rejected (claims 5-13 were previously cancelled). Claim 1 has been revised. Claim 1 is independent.

The Rejection Under 35 U.S.C. § 102

Claims 1-3 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Appln. Publn. No. 2002/0012015 to Tsukada et al.¹ Applicant respectfully traverses this rejection, and submits the following arguments in support thereof.

Claim 1 describes an expendable container including an expendable tank configured to store an expendable and having a piezoelectric sensor element attached thereto, the piezoelectric sensor element having a characteristic, a driving circuit configured to energize and de-energize the piezoelectric sensor element, a detection signal generation circuit configured to generate a detection signal including cycle information representing a cycle of an output voltage wave of the piezoelectric sensor element after the driving circuit energizes and de-energizes the piezoelectric sensor element, and a control module configured to control at least one of an impedance of a de-energizing circuit through which the piezoelectric sensor element de-energizes and a de-energizing time, in accordance with the characteristics of the piezoelectric sensor element, so as to be a certain level that reduces a noise element present in detecting the cycle information of the detection signal. The cycle information is available for determining whether a residual quantity of the expendable is greater than a preset level, and the control

¹ As pointed out previously in Applicant's Amendment filed on May 6, 2008, Tsukada is commonly assigned along with the present application. This discussion of Tsukada should not be construed to limit Tsukada, for the reasons given in that earlier Amendment.

module is configured to vary a property affecting an output signal of the piezoelectric sensor element.

In particular, the claimed configuration controls "at least one of an impedance of a de-energizing circuit and a de-energizing time" "in accordance with the characteristics of the piezoelectric sensor element", so as to obtain a sufficient S/N (signal-to-noise) ratio. However, neither Tsukada nor any of the other cited references discloses such a configuration.

Applicant traverses this rejection on grounds the Office Action's reasoning and characterization of Tsukada are not well-taken. As explained in detail below, Tsukada provides no teaching or suggestion of noise level adjustment -- the portions of Tsukada relied upon by the Office Action only are directed to basic aspects of ink quantity detection using a piezoelectric sensor.

In this regard, it is noted that the Office Action, at page 3, contends that a control module which controls at least one of an impedance of a de-energizing circuit through which the piezoelectric sensor element de-energizes and a de-energizing time is taught at paragraphs [0089] and [0090] of Tsukada. Although the Office Action then discusses the other aspects of the claimed control module which relate to controlling the vibration and amplitude of a residual vibration so as to be a certain level that reduces the noise element present in detecting the cycle information of the detection signal, the Office Action fails to identify any portion of Tsukada teaching such aspects of the invention. In other words, the Office Action effectively **admits** that such claim features are neither taught nor are suggested by Tsukada. Accordingly, in Tsukada there will be situations where a sufficient S/N ratio cannot be obtained when the noise level is high (the claimed invention solves this problem of a maintaining a sufficient S/N ratio). So

claim 1 patentably distinguishes over Tsukada because Tsukada neither teaches nor suggests at least these aspects of the invention.

Nor can this portion of the Office Action be interpreted as contending that, while Tsukada fails to specifically describe the claimed configuration, Tsukada inherently discloses the claimed configuration. Tsukada applies a voltage to a piezoelectric element to determine a resonant frequency (or the resonance amplitude difference). Tsukada states, at paragraph [0142]:

FIGS. 4A and 4B show a measuring method for the waveform of residual vibration of the actuator 106 and the residual vibration after vibrating the actuator 106. The vertical position of the ink level for the mounting position level of the actuator 106 in the ink cartridge can be detected by changes in the frequency of the residual vibration after the actuator 106 vibrates or changes in the amplitude. In FIGS. 4A and 4B, the ordinate axis indicates voltage of counter electromotive force generated by residual vibration of the actuator 106 and the transverse axis indicates time. By the residual vibration of the actuator 106, as shown in FIGS. 4A and 4B, the waveform of an analog signal of voltage is generated. Next, the analog signal is converted to a digital value corresponding to the signal frequency.

Accordingly, Tsukada can be construed to use the residual vibration for detection.

However, it is not possible to interpret this passage, or any other portions of Tsukada, to disclose or suggest to a person having ordinary skill in the art the claimed control module, which is described in full as:

a control module configured to control at least one of an impedance of a de-energizing circuit through which the piezoelectric sensor element de-energizes and a de-energizing time, in accordance with the characteristic of the piezoelectric sensor element, so as to be a certain level that reduces a noise element present in detecting the cycle information of the detection signal[.]

In other words, Tsukada fails to teach or suggest controlling the impedance of the de-energizing circuit or the de-energizing time according to the characteristic of the piezoelectric sensor element. It is not enough that for the Office Action to state noise adjustment can be made

just because it is possible to do so - there must be a showing of why one having ordinary skill in the art would be led to do so, and also, why the one of ordinary skill would do so in the manner claimed, in accordance with the characteristic of the piezoelectric sensor element so as to improve the S/N ratio.

Furthermore, claim 1 provides that the control module can vary a property affecting an output signal of the piezoelectric sensor. By way of non-limiting example, the disclosure teaches that this can be done by dynamically adjusting the resistance value of the circuit using four switches, Sa, Sb, Sc and Sd (meaning it is not adjusted in advance by a person), as explained in the specification at page 19, lines 3-10, for example. This claim feature also distinguishes over Tsukada, since Tsukada neither discloses nor suggests such adjustment. Accordingly, even if Tsukada's S/N ratio decreases over time, measurements are made without any adjustment to compensate for such variation, in contrast to the claimed invention.

A reference which does not identically disclose all the features of a claimed invention cannot anticipate that invention. Kloster Speedsteel AB v. Crucible Inc., 793 F.2d 1565, 1571 (Fed. Cir. 1986). See also In re Paulsen, 30 F.3d 1475, 1478-79 (Fed. Cir. 1994); Constant v. Advanced Micro-Devices Inc., 848 F.2d 1560 (Fed. Cir. 1988); M.P.E.P. § 2131 (8th ed., rev. 6) ("To anticipate a claim, the reference must teach every element of the claim").

Moreover, the Federal Circuit recently confirmed that, to anticipate, a reference must teach all the claim features arranged as in the claim: "the prior art reference - in order to anticipate under 35 U.S.C. § 102 - must not only disclose all elements of the claim within the four corners of the document, but **must also disclose those elements 'arranged as in the**

claim.” Net MoneyIN, Inc. v. Verisign, Inc., 545 F.3d 1359, 1369 (Fed. Cir. 2008) (emphasis added) (quoting Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 1548 (Fed. Cir. 1983)).

In addition, for there to be anticipation under § 102, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the art in the field of the invention. Scripps Clinic & Res. Found. v. Genentech Inc., 927 F.2d 1565, 1570 (Fed. Cir. 1991).

The remaining rejected claims, claims 2 and 3, both depend from, and so incorporate by reference all the features of claim 1, including those features just shown to patentably distinguish over the cited art. Accordingly, claims 2 and 3, by virtue of their dependencies from claim 1, patentable distinguish over Tsukada at least for the same reasons as claim 1.

For all the foregoing reasons, favorable reconsideration and withdrawal of this rejection are respectfully requested.

**The Rejection Under
35 U.S.C. § 103(a)**

Claim 4 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsukada in view of U.S. Patent No. 4,714,935 to Yamamoto et al. Applicant respectfully traverses this rejection, and submits the following arguments in support thereof.

Claim 4 depends from and so incorporates by reference all the features of claim 1, including those features just shown to patentably distinguish over Tsukada in Applicant's foregoing traverse of the § 102 rejection.

Applicant respectfully traverses this rejection on grounds Tsukada and Yamamoto are not properly combined. As the Office Action recognizes, Tsukada involves the use of a piezoelectric element sensor. However, the Office Action fails to recognize that Yamamoto is not concerned with detection of liquid by a piezoelectric sensor, and that Yamamoto uses a piezoelectric element to **eject** ink from an ink-jet head (see Yamamoto's title, abstract and claims), not to **detect** the presence or absence of ink.

The Office Action seeks to justify the combination of Tsukada and Yamamoto by contending one of ordinary skill in the art would do so "for the purpose of controlling the charging and discharging of the piezoelectric element and thus obtain improved results" (Office Action, pg. 7). However, the Office Action provides no persuasive explanation of why a person having ordinary skill in the art, seeking to improve upon a piezoelectric sensor and associated circuitry for **detecting** liquid, as taught by Tsukada, would look to the teachings of Yamamoto, which involves the use of a piezoelectric element and associated circuitry for **ejecting** liquid. In view of the substantially different considerations which are involved with using a piezoelectric element to detect liquid (i.e., as in Tsukada), and using a piezoelectric element to eject ink (i.e., as in Yamamoto), one having ordinary skill in the art would not be led to combine two references merely because they both use piezoelectric elements as the Office Action contends.

The Office Action's reasoning in support of the combination, to control the charging and discharging of the piezoelectric element to obtain improved results, is clearly erroneous, since controlling the charging of the piezoelectric element in the manner taught by Yamamoto does not improve the detection results of Tsukada's detector. Also, Yamamoto,

which uses the piezoelectric element to eject ink, does not teach and is not concerned with controlling the electrical signal following discharge of the piezoelectric element not concerned

Yamamoto does not disclose a circuit configuration for using a piezoelectric element as a sensor. Yamamoto discloses a circuit that is configured to use a piezoelectric element to vary the capacity of an ink chamber to **eject** ink. Accordingly, the technique disclosed by Yamamoto is not applicable to a case where a piezoelectric element is used as a sensor as Tsukada teaches, meaning one having ordinary skill in the art seeking to improve upon Tsukada would not look to Yamamoto.

Moreover, even if Tsukada and Yamamoto are combined, that combination only would provide a device which reduces noise in a piezoelectric element-**driving** circuit. The combination would not teach a configuration that reduces a noise element in a detection signal, such as a piezoelectric element sensor, as is claimed.

For all the foregoing reasons, claim 4 patentably distinguishes over the cited art, and so favorable consideration and withdrawal of this rejection are respectfully requested.

CONCLUSION

Applicant respectfully submits that all outstanding rejections have been addressed and are now overcome. Applicant further submits that all claims pending in this application are patentable over the prior art. Favorable reconsideration and withdrawal of those rejections and prompt allowance of this application are respectfully requested.

Other than the fees for the accompanying Petition for Extension of Time and Request for Continued Examination authorized therein, no fees are believed to be due in connection with the filing of this paper. Nevertheless, should the Commissioner deem any

additional fee(s) to be now or hereafter due in connection with this application, authority is given to charge all such fees to Deposit Account No. 19-4709.

In the event that there are any questions, or should additional information be required, please contact applicant's attorney at the number listed below.

Respectfully submitted,

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